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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils,
and Agricultural Engineering

H. T. & S. Office Report No. 231

Performance Test with Overhead Fan Cars. Grapes from Delano, Calif., to New York City, October 1949. 1/

By

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Division of Fruit and Vegetable Crops and Diseases

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May 15, 1950
Fresno, California

Performance Test with Overhead Fan Cars. Grapes from Delano, Calif., to New York City. October 1949. [1]

The purpose of this test was to compare the transit temperatures in the following cars:

Car 1. PFE 64516. Preco fans installed under floor-racks in the conventional manner.

Car 2. PFE 43821. Preco fans installed at the top bulkhead openings.

Car 3. PFE 43397. Equipco fans installed at the top bulkhead openings.

They were all 40' end-bunker cars in good repair with 3-1/2" insulation. Bunker capacity was 11,500 pounds ice in Car 1, and 10,000 pounds in Cars 2 and 3. Air circulation in the cars equipped with Preco fans (Cars 1 and 2) was accomplished by a series of seven blowers on a single shaft extending across the car near each bunker, whereas in the Equipco car the circulating air was concentrated largely along the centerline of the car by a single propellor type fan located at the center of the top bulkhead opening in each end of the car. The fans were axle-driven and circulated air from the ice bunker over the top of the load when the cars were in motion (reverse of natural circulation). Provisions were also made to attach electric motors to the fans for precooling the cars and loads while standing at the packing shed.

The cars were "billed" similarly as follows:

Car 1. 875 lidded lugs juice grapes WXX (6-7/16" lug) 44.38#, total 38,833 lbs. Standard Refrigeration, fans on.

Cars 2 & 3. 875 lidded lugs juice grapes (6-7/16" lug) - Freight Container Bureau container #1025 - 44.43#, total 38,876 lbs. Standard Refrigeration, fans on.

Temperatures were read with distant reading electric resistance thermometers inserted into the center of boxes of grapes loaded in the top, middle, and bottom layers of the load near the centerline of the car at the bunker, quarter-length, and doorway stacks. The temperature of the grapes near the wall was also taken in the 3rd stack of boxes from the bunker to determine the uniformity of cooling across the car.

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[1] The results of a cooperative test between the Pacific Fruit Express Company and the Division of Fruit and Vegetable Crops and Diseases, Bureau Plant Industry, Soils, and Agricultural Engineering, U.S. Department of Agriculture

The loads were divided type with center gates and with the boxes placed crosswise on bottoms 5 wide, 7 high, in 25 stacks. Stripping was by the vertical strip (Hoak) method.

Results

The transit temperatures obtained in the three cars (Figs. 1, 2, and 3) indicate slightly faster cooling of middle layers of the load en route in the overhead Preco fan car (Figs. 2) than in the other two cars (Fig. 1 and 3). Repeated tests would be needed to draw a valid conclusion in this respect.

Car 3 did not cool as readily as Car 2 along the side wall (Fig. 4) probably because the air blast in Car 3 was concentrated more along the centerline. Side wall temperatures were not obtainable in Car 1 owing to the failure of the thermometer at this position.

The top quarterlength position centerline cooled at the same rate in cars 1 and 2 whereas car 3 lagged behind somewhat for the first 4 days and then caught up, overcoming a higher initial temperature (Fig. 4).

The ice supplied each car en route is shown in Table 1. It ranged from 23,800 pounds in Car 3 to 26,700 pounds in Car 2. Car 1 with initial fruit temperature averaging 55°F. used a ton less ice than Car 2 with initial temperature somewhat warmer (59°). Car 3 starting with 63° fruit cooled the least and consequently used the least ice.

All cars arrived in satisfactory condition according to the following excerpts from the market inspection reports:

> "Alicante Grapes, full packs, good color, clean and bright, 3 to 4 percent raisining, less than 1 percent decay, no packages requiring recoopering attention."

Acknowledgments

The following persons and firms cooperated in the test: David Freedman and Co., Inc., shipper; S.P., U.P., C.G.W., and Erie Railroads; Richard Mantle, Preco Company; Ray Doering, James Jones, and Ralph Donaldson, P.F.E. Company.

TEMPERATURES IN TRANSIT

te(Mo. & Yr.) Oct. 1949 Car initial & No. PFE-64516

tents of Car Grapes Test Preco Floor Fan (U.S.D.A. Fresno 1949-2) Car 1

PLACE wn & State)	Day of Month	Time	Outside temp.	1	2	3	4	5	6	7	8	9	10	11	12
esno, Calif.	24	2P		Pre-iced 11,500 lbs.											
lano	25	Loading finished 10A		Grapes 55° F. Ave.											
				AIR	AIR	FRUIT									
				TB	BB	BB	MB	TB	BQ	OUT	TQ	MQ	BD	MD	TD
lano	25	3:30P	77	595	367	497	582	584	499		545	589	565	600	589
1/		5:00P	80	600	362	482	582	584	489		555	584	564	595	589
		7:00P	68	425	467	472	582	559	489		530	584	515	575	594
		9:00P	57	435	447	457	577	509	479		505	574	475	530	579
		11:30P	51	420	442	447	572	484	464		475	564	445	495	559
esno	26	9:00A	65	575	357	422	547	479	459		465	559	430	485	534
seville		10:00P	58	555	362	412	517	409	449		445	539	415	465	509
	27	7:00A	52	-	352	392	497	509	439		455	534	420	465	504
igrant Gap		12:01P	71	-	372	397	487	487	434		450	524	410	455	499
uckee		2:40P	67	-	407	397	487	419	439		445	524	415	455	499
rks, Nev.		4:30P	68	-	387	392	477	419	434		440	519	405	450	494
rlin	28	4:00A	17	-	377	397	462	404	424		415	504	390	430	479
den, Utah		3:30P	64	555	382	392	447	379	414		395	494	375	410	459
een Riv., Wyo.	29	5:15A	41	425	352	382	432	374	419		390	499	375	405	439
tter Creek		9:30A	40	395	-	382	432	364	414		390	479	375	405	434
wlins		11:45A	38	375	367	382	427	364	409		385	494	370	400	434
ramie		5:15P	33	370	367	377	417	359	404		380	489	365	390	434
eyenne	30	12:01A	34	385	352	377	422	359	419		385	484	370	395	424
Platte, Neb.		8:15A	35	385	342	372	407	349	399		370	474	365	390	419
arney		3:15P	46	395	332	362	402	349	389		370	454	355	380	414
.Bluffs, Ia.		9:45P	33	400	-	357	397	354	384		375	464	360	380	414
. Dodge	31	9:45A	24	365	347	372	387	344	379		370	454	350	370	399
lwein, Ill.		2:00P	36	365	347	367	382	369	359		365	449	345	365	399
ue Island	11/1	1:00A	24	-	327	402	382	369	359		350	434	335	355	369
mmond, Ind.		10:45A	47	345	-	377	377	369	354		350	434	340	360	369
ntington		3:00P	46	325	322	382	377	399	349		350	434	330	350	374
rion, O.		7:30P	38	320	322	377	372	384	344		340	424	325	350	374
lamanca, N.Y.	2	10:30A	44	325	307	337	362	379	339		330	414	315	335	364
rnell		12:45P	58	325	312	337	362	384	334		330	409	315	335	359
squehanna, Pa.		6:10P	48	335	312	342	362	379	339		-	404	325	340	364
rsey City, N.J.	3	2:00A	44	330	307	337	362	369	339		330	404	325	345	364
do.		11:30A	58	350	307	337	357	374	339		335	389	330	345	364
do.		7:00P	58	375	302	337	357	384	344		345	394	330	350	369
do.	4	9:00A	48	375	307	337	352	414	344		355	399	340	355	379
		Car opened 9:30A for Auction inspection.													

Precool 5:00P to 11:30P.

TEMPERATURES IN TRANSIT

te (Mo. and Yr.) Oct. 1949 Car initial & No. PFE-43821

ntents of Car Grapes Test Preco Overhead Fan (U.S.D.A. Fresno 1949-2) Car 2

PLACE Town & State)	Day of Month	Time	Outside temp.	1	2	3	4	5	6	7	8	9	10	11	12
esno, Calif.	10/24	2:00P		Pre-iced 10,000 lbs.											
lano	25	Loading finished 1:30P Grapes 59°F. ave.													
				AIR	AIR		FRUIT					So.			
				BB	TB	BB	MB	TB	BQ	MQ	TQ	WALL	BD	MD	TD
lano	25	3:30P	77	355	638	577	580	603	589	628	605	610	605	610	598
1/		5:00P	80	355	628	567	585	608	579	628	610	615	595	620	603
		7:00P	68	490	448	562	585	573	564	628	595	605	565	615	603
		9:00P	57	475	438	552	580	483	544	613	545	575	505	590	593
		11:30P	51	465	428	537	565	443	529	598	505	560	470	575	578
esno	26	9:00A	65	355	488	507	545	433	504	573	495	545	465	530	553
seville		10:00P	58	355	458	487	525	403	479	548	465	505	435	485	518
	27	7:00A	52	340	473	457	510	403	464	538	475	510	435	480	508
igrant Gap		12:01P	71	355	443	457	505	403	459	528	460	500	425	465	503
ickee		2:40P	67	370	418	457	495	398	454	523	455	490	420	460	498
irks, Nev.		4:30P	58	380	388	452	495	398	449	518	450	485	415	455	493
clin	28	4:00A	17	355	388	442	470	373	439	498	420	445	395	425	463
ien, Utah		3:30P	64	380	373	422	445	368	424	468	395	420	385	405	433
ien Riv., Wyo.	29	5:15A	41	340	388	417	430	363	414	453	385	405	380	395	423
ter Creek		9:30A	40	360	368	417	430	368	414	453	395	410	385	395	423
lins		11:45A	38	345	368	407	420	358	404	443	385	400	390	385	408
amie		5:15P	33	355	358	402	415	363	404	438	380	395	370	385	403
yenne	30	12:01A	34	340	368	402	410	363	404	433	380	395	370	385	403
Platte, Neb.		8:15A	35	340	348	397	400	353	394	423	370	380	360	370	393
rney		3:15P	46	340	348	383	390	348	394	408	360	375	355	360	383
Bluffs, Ia.		9:45P	33	335	338	383	380	343	379	403	355	365	350	355	373
Dodge	31	9:45A	24	330	323	367	370	328	369	393	345	355	340	345	363
wein, Ill.		2:00P	36	330	332	367	370	333	364	388	345	355	340	345	358
e Island	11/1	1:00A	24	325	328	362	365	318	364	383	340	345	340	345	358
mond, Ind.		10:45A	47	320	333	357	360	328	359	373	345	350	340	340	348
tington		3:00P	46	335	338	357	360	333	359	378	345	345	340	340	353
ion, O.		7:30P	38	330	333	357	355	333	359	373	345	340	340	335	353
lamanca, N.Y.	2	10:30A	44	330	333	352	350	343	359	368	345	340	335	335	348
nell		12:45P	58	330	333	352	350	333	354	363	345	340	340	335	348
quehanna, Pa.		6:10P	48	335	338	352	350	335	359	363	345	340	345	335	353
sey City, N.J.	3	2:00A	44	330	333	347	350	328	354	358	345	340	340	330	348
do.		11:30A	58	330	343	347	345	328	359	353	345	335	340	335	348
do.		7:00P	58	335	388	352	350	348	364	363	365	345	345	340	363
do.	4	9:00A	48	330	375	352	350	353	364	363	370	345	350	345	368
	Car opened 9:30A for Auction inspection.														

Precool 5:00P to 11:30P

P C. Fans Off 5:30P to 6:30P

TEMPERATURES IN TRANSIT

te (Mo. and Yr.) Oct. 1949 Car initial and No. PFE-43397

tents of Car Grapes Test Equipco Overhead Fan (U.S.D.A. Fresno 1949-2) Car 3

PLACE (wn & State)	Day of Month	Time	Outside temp.	1	2	3	4	5	6	7	8	9	10	11	12
sno, Calif.	24	2:00P		Pre-iced 10,000 lbs.											
lano	25	Loading finished 3P. Grapes 63°F. ave.													
				AIR	AIR		FRUIT					So.			
				BB	TB	BB	MB	TB	BQ	MQ	TQ	Wall	BD	MD	TD
lano	25	4:00P	80	387	697	607	643	620	638	640	650	610	636	664	663
1/		5:00P	80	387	652	602	643	620	638	690	655	610	626	654	663
		7:00P	68	492	417	582	613	445	618	640	620	600	581	644	638
		9:00P	57	477	417	552	603	430	598	635	585	580	546	629	628
		11:30P	51	462	417	532	583	425	578	625	545	560	526	614	608
sno	26	9:00A	65	382	512	507	553	425	533	595	535	545	501	579	578
eville		10:00P	58	372	492	472	553	400	493	570	515	535	471	539	553
	27	7:00A	52	352	512	442	543	405	468	570	515	530	451	524	543
grant Gap		12:01P	71	362	502	432	528	425	458	540	505	525	446	509	533
ckee		2:40P	67	387	472	432	513	420	453	535	505	525	441	504	523
rks, Nev.		4:30P	68	387	457	432	508	400	458	530	505	525	431	499	523
lin	28	4:00A	17	372	427	432	493	415	458	515	470	495	426	469	493
len, Utah		3:30P	64	387	427	417	478	385	438	495	450	480	411	454	463
en Riv., Wyo.	29	5:15A	41	352	442	402	428	360	418	475	425	460	391	429	438
ter Creek	29	9:30A	40	372	397	402	-	365	423	475	425	465	396	439	443
lins		11:45A	38	357	412	397	-	365	423	470	415	455	391	429	438
amie		5:15P	33	357	402	397	-	360	423	470	410	450	391	429	433
yenne	30	12:01A	34	352	437	397	-	360	418	460	405	450	396	424	423
Platte Neb.		8:15A	35	347	382	387	438	355	408	445	395	430	386	414	408
rney		3:15P	46	352	377	377	433	350	398	435	380	420	376	419	398
Bluffs, Ia.		9:45P	33	352	377	372	428	340	398	425	370	410	371	410	393
Dodge	31	9:45A	24	337	352	362	383	325	378	410	360	405	356	404	378
wein, Ill.		2:00P	36	342	352	362	403	335	373	410	360	400	366	399	378
e Island	11/1	1:00A	24	332	362	362	413	335	373	405	355	395	361	389	373
mond, Ind.		10:45A	47	327	372	357	433	345	368	395	360	390	356	379	373
tington		3:00P	46	352	382	362	408	350	368	400	360	390	361	384	378
ion, O.		7:30P	38	342	367	362	408	340	363	395	360	390	366	384	373
amanca, N.Y.	2	10:30A	44	342	372	362	413	340	368	390	355	380	361	379	368
nell		12.45P	58	342	377	362	413	345	363	385	355	365	361	379	368
quehanna, Pa.		6:10P	48	347	387	357	408	350	363	380	355	370	366	374	373
sey City, N.J.	3	2:00A	44	337	362	362	448	345	368	380	355	370	361	384	373
do		11:30A	58	332	392	362	438	360	363	380	365	375	361	384	373
do		7:00P	58	337	422	362	-	370	378	385	375	385	366	394	388
do	4	9:00A	48	367	397	362	368	370	363	375	375	380	361	369	388
		Car opened 9:30A for Auction inspection.													

Precool 5:00P to 11:30P.

Table 1 - Icing Record
Grape Transportation Test
U.S.D.A. Fresno test 1949-2
with PFE
Oct. 1949

Station	Date	Time	Ice Supplied		
			PFE 64516 Car 1	PFE 43821 Car 2	PFE 43397 Car 3
Fresno, Calif.	10/24	2P	11,500	10,000	10,000
do.	10/26	10A	4,100	4,000	4,400
Roseville	10/27	12:30A	600	600	800
Sparks, Nev.	10/27	4:30P	800	1,500	1,200
Carlin	10/28	4A	0	0	0
Ogden, Utah	10/28	6P	900	2,800	2,600
Laramie, Wyo.	10/29	5:45P	1,200	1,400	1,000
No. Platte, Neb.	10/30	8:15A	0	0	0
Co. Bluffs, Ia.	10/30	10P	1,200	1,400	1,100
Oelwein, Ill.	10/31	3P	1,400	1,200	500
Blue Island	11/1		1,600	2,200	800
Marion, O.	11/1	7:30P	800	600	900
Hornell, N.Y.	11/2	12:45P	600	1,000	500
Total			24,700	26,700	23,800

Fig. 1

TRANSIT TEMPERATURE OF GRAPES
DELANO, CALIF., TO NEW YORK CITY
CAR NO. 1 P.F.E. 64516
PRECO FLOOR FAN. OCTOBER 1949
STANDARD REFRIGERATION.

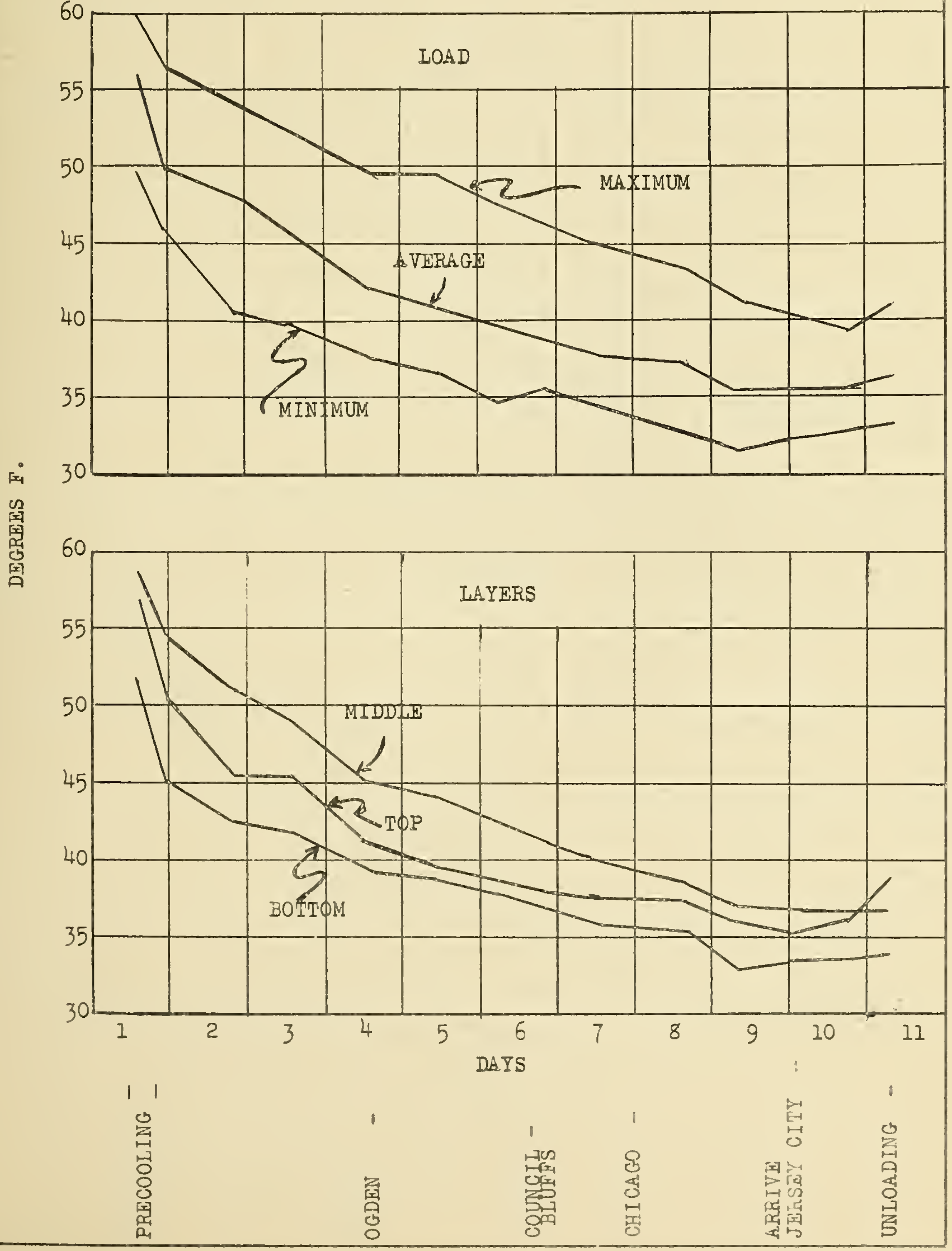

Fig. 2

TRANSIT TEMPERATURE OF GRAPES
DELANO, CALIF., TO NEW YORK CITY
CAR NO. 2 P.F.E. 43821
PRECO OVERHEAD FAN. OCTOBER 1949.
STANDARD REFRIGERATION.

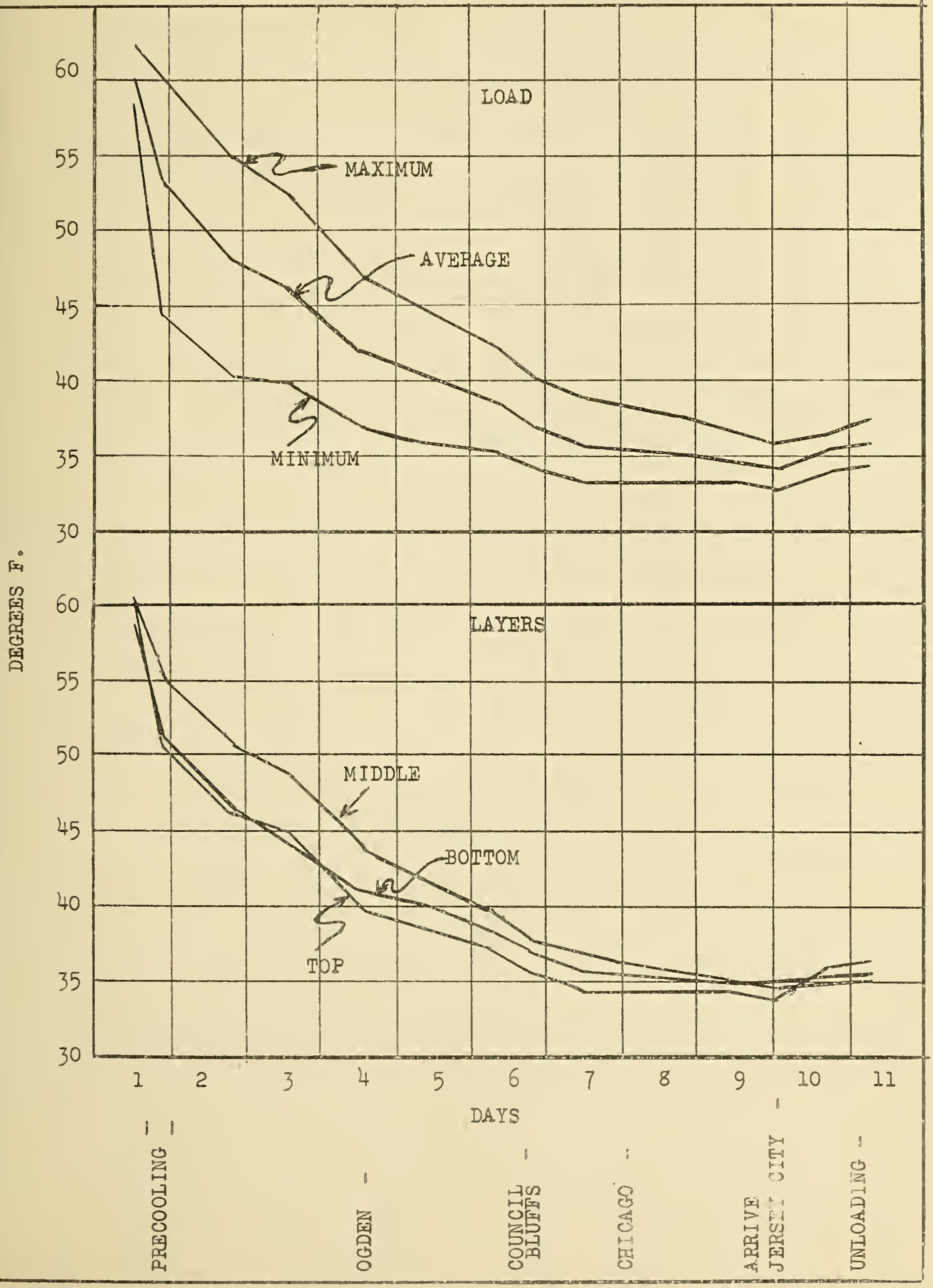

Fig. 3

TRANSIT TEMPERATURE OF GRAPES
DELANO, CALIF., TO NEW YORK CITY
CAR NO. 3 P.F.E. 43397
EQUIPCO OVERHEAD FAN. OCT. 1949

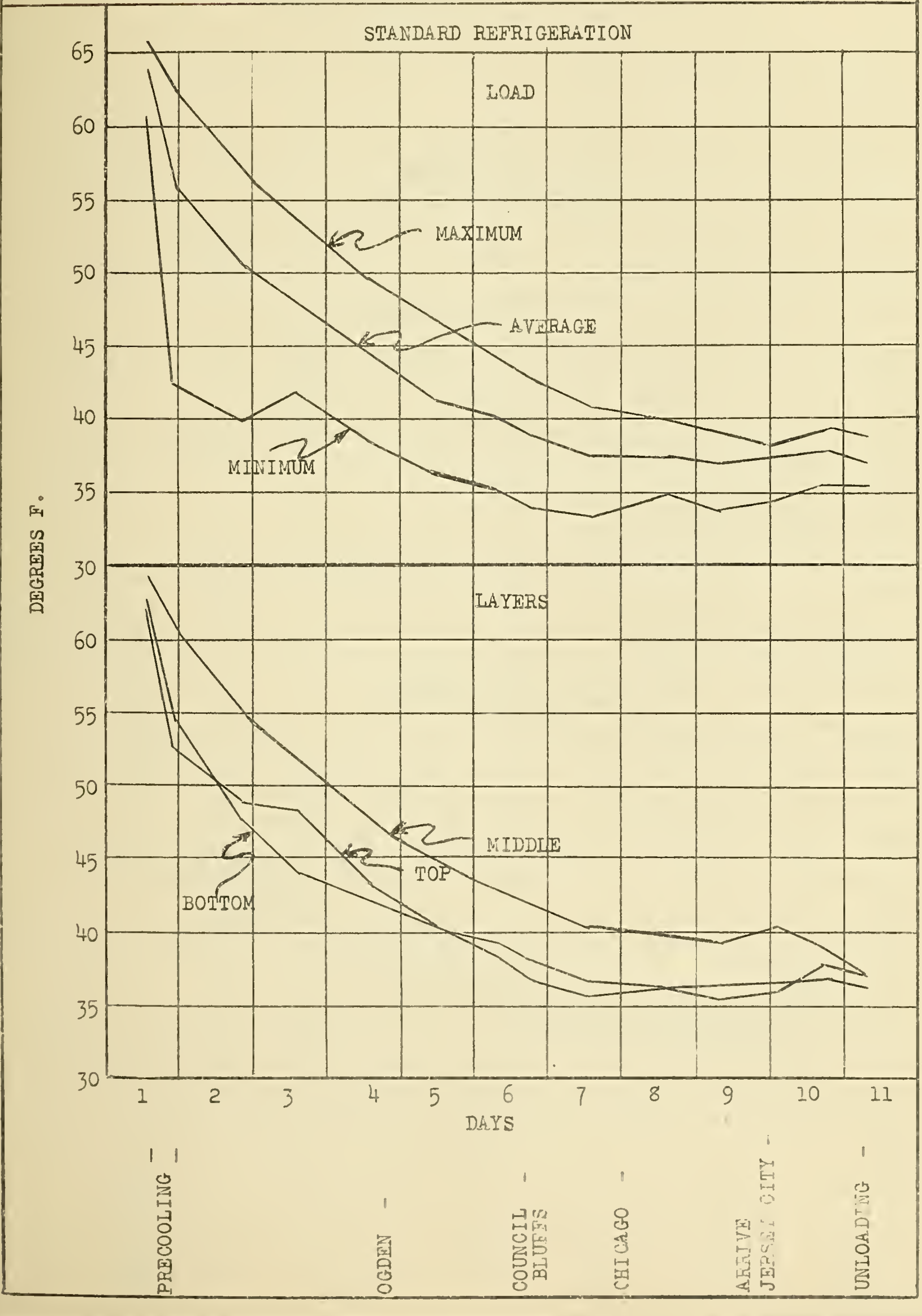

Fig. 4 COMPARISON OF TRANSIT TEMPERATURE OF GRAPES IN PRECO OVERHEAD FAN CAR (CAR 2) AND EQUIPCO OVERHEAD FAN CAR (CAR 3) AT SIDE WALL AND CARS 2 AND 3 AND CONVENTIONAL PRECO FAN CAR (CNRI) AT CENTER LINE POSITIONS. DELANO, CALIF., TO NEW YORK CITY, OCT. 1949.